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journal homepage: <http://ees.elsevier.com/pmedr>Perceptions of cancer risk factors and socioeconomic status. A French study[☆]Patrick Peretti-Watel^{*}, Lisa Fressard, Aurélie Bocquier, Pierre Verger^a INSERM, UMR912 "Economics and Social Sciences Applied to Health & Analysis of Medical Information" (SESSTIM), 13006 Marseille, France^b Aix Marseille University, UMR_S912, IRD, 13006 Marseille, France^c ORS PACA, Southeastern Health Regional Observatory, 13006 Marseille, France

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ABSTRACT

Objective: The present paper investigates on lay people's beliefs regarding cancer risk factors' and their correlates, especially people's socioeconomic status (SES), as they may heavily contribute to social health inequalities. **Methods:** We used data from the 2010 *Baromètre Cancer*, a national representative telephone survey conducted in France (N = 3359, age 15–75, participation rate 52%). **Results:** Respondents differentiate behavioral factors (smoking, drinking, unprotected sun exposure, etc.), environmental risk factors (air pollution, chemicals in food, etc.) and psychosocial risk factors (stress, painful experiences, etc.) for cancer. Those with a higher SES were more likely to emphasize behavioral and psychosocial factors, while those with an intermediate SES were more likely to do so for environmental ones. Perceived financial vulnerability was associated to higher perceptions for both environmental and psychosocial factors. After adjustment on socio-demographic background and SES, respondents who emphasized behavioral risk factors were less prone to endorse fatalistic attitudes (considering that nothing can be done to avoid cancer), while those who emphasized environmental risk factors were more prone to do so, and were also more frequently daily smokers. **Conclusion:** These results suggest that lay people's beliefs regarding cancer risk factors are shaped by their conceptions regarding one's body and health, and especially their health locus of control, as the tendency to either emphasize behavioral or environmental factors was correlated to fatalistic attitudes. Prevention campaigns designed to tackle lay people's perceptions regarding cancer risk factors should not consider they simply reflect ignorance or misinformation, as they are embedded in social and cultural contexts.

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Introduction

Cancer heavily contributes to social health inequalities (HCSF [French High Council for Public Health], 2009; Huisman et al., 2005). Such inequalities arise at every stage of cancer history (that is before and after diagnosis) as well as among cancer survivors (Merletti et al., 2011; INCA [French National Institute for Cancer], 2014). For example, people with a low socioeconomic status (SES) are more prone to engage in risky behaviors (such as cigarette smoking), more frequently exposed to carcinogens at home or in their workplace, less likely to participate in cancer screening programs and more likely to be diagnosed later than people with higher SES (Merletti et al., 2011; Peretti-Watel et al., 2009).

Two main kinds of explanations (not mutually exclusive) have been proposed to elucidate the SES disparities in health-related behaviors, referring to either structural factors or cognitive ones (Lynch et al., 1997; Wardle and Steptoe, 2003). On the one hand, structural explanations

stress the importance of material and social contexts, and view poor health behaviors as the consequences of material hardship, stressful life conditions or lack of social support. On the other hand, the SES disparities in health-related cognitions, including knowledge, attitudes and beliefs, may also fuel the SES disparities in health behaviors. For example, in the case of screening for bowel cancer, Wardle et al. concluded that cognitive factors play a leading role in the relationship between SES and intention to go for screening (Wardle et al., 2004).

The present paper focuses on the second kind of explanations, the one referring to SES disparities in cancer risk beliefs. Several previous studies found a significant relationship between SES and fatalistic cancer beliefs: people with a low income or a low educational level are more prone to consider that 'everything causes cancer' and such belief may fuel a sense of powerlessness that prevents people from engaging in cancer prevention behaviors (Powe, 1995; Niederdeppe and Levy, 2007; Peek et al., 2008; Befort et al., 2013; Marcus et al., 2013). There is of course an obvious link between such fatalism and one major aspect of people's beliefs regarding health and illness issues, namely the health locus of control: some people consider their health mainly depends on external forces beyond their control (external locus of control, which may fuel fatalism), while others rather consider it depends on their

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behaviors (internal locus of control) (Wallston et al., 1978). In her classic study on social representations of health and illness (Herzlich, 1973) delved further into this issue. She found that, for many people, health resides within the individual while the sources of illness lies outside, in their social environment. More specifically, many people think that modern society and social life produce illness, and especially cancer, as they 'intoxicate' both people's body and mind: on the one hand, artificial food and pollution, among others, intoxicate the body, and on this other hand, stress, bitterness, disappointment and other negative emotions poison the mind. Those negative emotions, which are frequently referred to as 'psychosocial factors' now, have been considered as potential causes of cancer for several centuries (Lebrun, 1984), and these beliefs related to the psychogenesis of cancer are still quite widespread in contemporary French society (INPES [French Institute for Prevention and Health Education], 2006; INPES [French Institute for Prevention and Health Education], 2011). In the present study we investigated in detail lay people's perceptions of cancer etiology, by distinguishing various kinds of cancer risk factors that are usually merged into the statement 'everything causes cancer', in order to capture fatalistic attitudes, but also beliefs related to the psychogenesis of cancer. To do so, we used data from the 2010 *Baromètre Cancer*, a national representative survey conducted in France by the French National Institute for Prevention and Health Education (INPES). Its questionnaire embraces a broad spectrum of lay people's beliefs regarding the etiology of cancers, including behavioral risk factors (e.g. smoking), environmental risk factors (e.g. air pollution) and psychosocial risk factors (e.g. stress) (INPES [French Institute for Prevention and Health Education], 2006; INPES [French Institute for Prevention and Health Education], 2011).

We aimed to test three hypotheses. First, we assumed that people's perceptions were shaped by their conceptions of one's body and health, thus we expected strong positive correlations between perceptions related to risk factors pertaining to the same type (behavioral risk factors for an internal locus of control, environmental ones for an external locus of control, and psychosocial ones for beliefs related to the psychogenesis of cancer) (Hypothesis 1). Secondly, we assumed that lay people's perceptions of cancer-related risk factors were correlated to their SES. More precisely, we expected that people with a high SES were more likely to emphasize behavioral risk factors (internal locus of control) while those with a low SES were more likely to emphasize environmental risk factors (external locus of control), and we also assumed that people with a higher SES were more prone to emphasize psychosocial factors, as Herzlich had conducted her interviews with people from the middle and upper classes (Hypothesis 2). We used both an objective composite indicator of SES (combining income, occupation and education) as well as a subjective one (perceived financial situation of one's household). Thirdly, as previous studies found that people who endorse the 'everything causes cancer' belief are more likely to feel powerless and to engage in risk behaviors, we tested the relationship between our three kinds of perceptions of cancer-related risk factors and two outcome variables: a fatalistic attitude ('nothing can be done to avoid cancer') and a major risk behavior (cigarette smoking). We assumed that people who stressed the importance of environmental risk factors for cancer were more likely to feel powerless and to report current smoking (Hypothesis 3).

Material & methods

Sampling design and data collection

We used data from the second Cancer KABP survey, a survey on cancer-related knowledge, attitudes, beliefs and practices conducted by the National Institute for Prevention and Health Education (INPES). This telephone survey (using a computer-assisted telephone interview system) was carried out in 2010 on a representative random sample of the general population aged 15–85, based on a two-stage random sampling design (first selecting households by phone number, secondly

selecting an individual within each participating household). People not speaking French and residents of retirement homes, hospitals, and other institutions were excluded from the survey. The participation rate was 52%. Questions related to perceptions of cancer risk factors were only asked to individuals without a personal history of cancer and aged 15–75 ($n = 3359$).

The French National Commission for Computer Data and Individual Freedom (*Commission Nationale de l'Informatique et des Libertés*, CNIL) approved the 2010 *Baromètre Cancer*.

Questionnaire

The questionnaire included 14 items on perceptions of risk factors for cancer, proposed in a random order. For each item, respondents were asked to report whether they thought this factor could increase a person's risk of developing a cancer ('certainly not', 'probably not', 'probably', 'certainly', 'don't know'/no response). These items covered three kinds of risk factors: behavioral factors (tobacco smoking, drinking more than 2 (for women) or 3 (for men) glasses of alcohol per day, sun exposure without protection, lack of physical activity, having tanning lamp sessions, cannabis smoking); environmental factors (exposure to air pollution, chemicals in food, living near a nuclear power plant, or near a mobile phone relay station); psychosocial factors (stress, painful experiences, difficulties in expressing feelings and emotions, bitterness due to personal or professional disappointment).

The questionnaire also investigated respondents' general opinion on cancer, with an item specifically designed to identify fatalistic attitudes ('Nothing can be done to avoid cancer': 'strongly disagree', 'somewhat disagree', 'somewhat agree', 'strongly agree', 'don't know'), as well as respondents' smoking status (with a binary indicator spotting current daily smokers, i.e. respondents who reported that they smoked at least one cigarette per day at the time of the survey). Other data collected included respondents' main information sources on cancer (they had to choose two sources among the following ones: TV/radio/newspapers, Internet, relatives, health professionals, health magazines), and having at least one relative with a history of cancer (yes/no). Indeed another important aspect regarding lay people's perceptions of cancer risk factors is the kind of information they use, especially in the Internet society (Befort et al., 2013; Peretti-Watel et al., 2014), and previous studies found that family cancer history was correlated to cancer-related attitudes and beliefs (Marcus et al., 2013; Kobayashi and Smith, 2015). Respondents' self-reported socio-demographic characteristics included gender, age, educational level (<high-school, high-school, >high-school), occupation status (unemployed, manual worker, intellectual worker) and equivalized household income per month (EHI), which takes into account the household size and composition. Finally, participants were asked about their perceived household financial situation (living comfortably, going well, getting by, finding it difficult, impossible without debt). We considered this last question because it is a subjective indicator of SES, and as we tried to capture the impact of SES on specific perceptions, we assumed that perceived SES may be more predictive than 'objective' SES. More specifically, one's perceived vulnerability may influence one's beliefs regarding cancer etiology.

Statistical analysis

Data were weighted to match the sample more closely to the French population for age, gender, educational level, geographic area and size of residency town. All analyses were performed with weighted data.

We first conducted a principal component analysis (PCA) on the 14 items related to perceptions of risk factors (with the following coding: certainly not = 1, probably not = 2, probably = 3, certainly = 4, don't know/missing value = 2.5). PCA is a useful statistical method for identifying correlational patterns in a large data set as it highlights the strongest bivariate correlations existing between selected variables. It is a useful preliminary step before combining numerical variables into

a synthetic score. As we assumed that people's perceptions were shaped by their health locus of control and by their beliefs toward the psychogenesis of cancer, we expected strong positive correlations between perceptions related to risk factors pertaining to the same type (either behavioral, environmental or psychosocial) (Hypothesis 1). This hypothesis was validated, as the PCA identified three main factors from the responses, each corresponding to one distinctive set of items (see Appendix, Table S1). Then we built three scores of risk perception, by summing the responses to the corresponding items (behavioral risk factors: 6 items, Cronbach's alpha = 0.64; environmental risk factors: 4 items; Cronbach's alpha = 0.58; psychosocial risk factors: 4 items, Cronbach's alpha = 0.77).

Regarding respondents' SES, we used a subjective indicator (perception of the household financial situation) and we also built a score combining educational level, occupation status and equivalized household income (see Stamatakis et al., 2009; Stamatakis et al., 2010 for details). The resulting score ranged from 0 (<high-school, unemployed, first tercile of income distribution) to 6 (>high-school, executive manager, third tercile of income distribution).

Secondly, in order to investigate the relationships between perceptions of cancer risk factors and socioeconomic position (Hypothesis 2), we modeled separately the associations between the three corresponding scores (dependent variables) and SES indicators, with multiple linear regressions adjusted for sex, age, relative's history of cancer and main source of information on cancer.

Finally, multiple logistic regressions, adjusted for gender, age, SES and relative's history of cancer were conducted to test whether these three scores were associated with a fatalistic attitude toward cancer as well as with respondents' smoking status (Hypothesis 3). Regarding fatalistic attitudes, the five response items were merged into a binary indicator ('Nothing can be done to avoid cancer': 'somewhat agree' and 'strongly agree' versus other responses).

Results

Perceptions of cancer risk factors and sources of information on cancer

Most risk factors mentioned in the survey were considered as probable or certain causes of cancer by the majority of respondents (Table 1).

It was especially true for smoking (97.7% of respondents answered that it causes cancer 'probably' or 'certainly'), air pollution (94.0%) and chemically-treated food (93.5%), but more controversial environmental factors were also widely considered dangerous (79.2% for living near a

nuclear power plant, 69.1% for living near a mobile telephone relay station). Respondents' perceptions were more balanced regarding some psychosocial risk factors: only 49.9% believed that bitterness due to personal or professional disappointment may cause cancer, and 38.9% answered the same for having difficulties in expressing feelings and emotions.

Regarding information sources on cancer, 72.5% of respondents reported that either TV radio or newspapers were one of their two main sources of information, while other sources were much less frequently mentioned (31.6% for relatives, 24.5% for health professionals, 24.2% for the Internet, 23.8% for health magazines).

Factors associated with perceptions of cancer risk factors

Regarding demographic characteristics and relative's history of cancer, the results depended on the score considered (Table 2). For example, the behavioral risk factors score was significantly higher for the youngest respondents, while the psychosocial risk factors score was significantly higher for older respondents. Regarding the main information sources on cancer, those respondents who relied mainly on health professionals were more likely to be aware of behavioral risk factors, while those who mentioned health magazines as their main source of information on cancer were more prone to highlight the three kinds of risk factors: behavioral, environmental and psychosocial ones. Moreover, respondents who did report relative's history of cancer were more likely to emphasize both behavioral and psychosocial risk factors.

Regarding Hypothesis 2, respondents with a higher SES score were more likely to consider that behavioral as well as psychosocial factors may cause cancer, but they were less prone to think so for environmental factors, which were more frequently considered as cancer risk factors by respondents with an intermediate SES score. Regarding perceived financial vulnerability of one's household, respondents who reported current difficulties were more likely to consider that both environmental and psychosocial factors may cause cancer.

Perceptions of cancer risk factors, fatalistic attitude and smoking status

Overall, 32.4% of respondents agreed that 'nothing can be done to avoid cancer'. Once controlled for the effects of gender, age, relative's history of cancer and SES, two scores of perceptions of cancer risk factors remained significant predictors of this fatalistic attitude (Table 3). On the one hand, people who were prone to emphasize behavioral risk factors were more likely to reject this attitude (ORa = 0.94,

Table 1

Lay people's perceptions of various cancer risk factors (France, 2010, n = 3359).

	Certainly not	Probably not	Probably	Certainly	Don't know/no response
Row %					
<i>Behavioral risk factors</i>					
Tobacco smoking	1.4	0.8	23.2	74.5	0.1
Alcohol drinking ^a	7.2	16.1	40.2	36.2	0.3
Having sun exposure without protection	1.6	1.8	27.0	69.6	0.0
Lack of physical activity	12.2	25.5	38.9	23.1	0.3
Having tanning lamp sessions	3.7	7.0	43.0	45.2	1.1
Cannabis smoking	5.0	12.8	37.0	42.8	2.4
<i>Environmental risk factors</i>					
Eating chemically-treated food	2.1	4.3	39.6	53.9	0.1
Breathing a polluted air	1.9	4.0	42.6	51.4	0.1
Living near a nuclear powerplant	5.1	15.1	34.3	44.9	0.6
Living near a mobile telephone relay station	6.8	21.3	46.5	22.6	2.8
<i>Psychosocial risk factors</i>					
Suffering from stress of the modern life	10.0	16.3	40.0	33.3	0.4
Being weakened by painful experiences	16.2	22.4	33.8	27.1	0.5
Having difficulties in expressing feelings and emotions	28.0	32.0	24.6	14.3	1.2
Being bitter because of personal/professional disappointments	19.9	29.4	32.0	17.9	0.8

^a Drinking more than 2 (for women) or 3 (for men) glasses of alcohol per day.

Table 2Factors associated with the scores of perceptions of cancer risk factors: results from multiple linear regression models (France, 2010, n = 3331^a).

	n	Behavioral risk factors	Environmental risk factors	Psychosocial risk factors
		β	β	β
Intercept		19.63***	12.40***	8.38***
<i>Adjustment variables</i>				
Sex: female (ref.: men)	1698	−0.53***	0.10	0.06
Age (ref.: 15–19 years old)				
20–25	349	−0.21	−0.25	0.23
26–34	532	−0.40	−0.36*	1.17***
35–44	649	−0.26	−0.35*	1.56***
45–54	626	−0.76***	−0.29	2.41***
55–64	523	−0.80***	−0.47**	2.39***
65–75	364	−1.12***	−0.35*	2.54***
Relative's history of cancer: yes (ref.: no)	2084	0.36***	0.09	0.52***
<i>Socioeconomic characteristics</i>				
SES score (ref.: 5–6, highest SES)				
0–1 (lowest SES)	914	−0.94***	0.15	−0.67***
2	730	−0.60***	0.28*	−0.35*
3	555	−0.20	0.23	−0.23
4	457	−0.02	0.50***	0.15
Perception of the household financial situation (ref.: living comfortably)				
Impossible without debt	107	−0.15	0.63**	0.84**
Finding it difficult	347	0.19	0.47**	0.62**
Getting by	928	0.25	0.33**	0.39*
Going well	1424	−0.02	−0.13	0.19
<i>Main information sources on cancer</i>				
TV/radio/newspapers: yes (ref.: no)	2414	0.53**	0.20	−0.08
Internet: yes (ref.: no)	809	0.44**	0.21	0.09
Relatives: yes (ref.: no)	1053	0.33*	0.24*	0.15
Health professionals: yes (ref.: no)	822	0.72***	0.15	−0.08
Health magazines: yes (ref.: no)	788	0.72***	0.56***	0.33*

SES: socioeconomic status.

^a 28 (0.83%) respondents were excluded from the analyses because of missing data.* $P \leq .05$.** $P \leq .01$.*** $P \leq .001$.

$p < 0.001$); on the other hand, people who tend to emphasize environmental risk factors were more likely to endorse it. Regarding smoking status, after adjustment on the same confounding factors, respondents who emphasized environmental risk factors for cancer were more frequently daily smokers (ORa = 1.06, $p < 0.05$).

Discussion

Main results and tested hypotheses

In our survey, respondents tend to differentiate behavioral, environmental and psychosocial risk factors for cancer. Those with a higher SES

Table 3Associations between the scores of perceptions of cancer risk factors, fatalistic attitudes and smoking status: results from multiple logistic regression models^a (France, 2010, n = 3348^b).

Scores of perception	Nothing can be done to avoid cancer	Daily smoker
	ORa (95 CI)	ORa (95 CI)
Behavioral risk factors	0.94 [0.91;0.97]***	1.00 [0.97;1.03]
Environmental risk factors	1.05 [1.01;1.10]*	1.06 [1.01;1.10]*
Psychosocial risk factors	0.98 [0.95;1.01]	1.00 [0.97;1.03]

ORa: adjusted odds ratio and 95% confidence interval (CI). As the three covariates are quantitative score, adjusted odds ratios assessed the impact of a variation of +1 for each score.

^a All models were adjusted for gender, age, socioeconomic status score, and relative's history of cancer.

^b 11 participants were excluded from the analyses because of missing data.

* $P \leq .05$.** $P \leq .01$.*** $P \leq .001$.

score were more prone to emphasize behavioral and psychosocial factors, while those with an intermediate SES were more likely to emphasize environmental ones. Perceived financial vulnerability was associated to higher perception scores for both environmental and psychosocial factors. After adjustment on socio-demographic background and SES, respondents who emphasized behavioral risk factors were less prone to endorse fatalistic attitudes (considering that nothing can be done to avoid cancer), while those who emphasized environmental risk factors were more prone to do so, and were also more frequently daily smokers.

These results suggest that lay people's beliefs regarding cancer risk factors are shaped by their conceptions regarding one's body and health, and especially their health locus of control and their beliefs toward the psychogenesis of cancer (Hypothesis 1). As expected, we also found significant SES disparities in these beliefs (Hypothesis 2), and regarding the third hypothesis we found some significant correlations between these beliefs and fatalistic attitudes and smoking status.

Limitations of the study

Before discussing our results, we have to acknowledge several limitations of the present study. First, regarding the design of the Cancer KABP survey, contrary to qualitative methods, a closed-ended questionnaire prevents respondents from qualifying or justifying their responses. It is therefore possible that we missed important aspects of people's perceptions of cancer risk factors. Secondly, statistical analyses based on cross-sectional data dealing with opinions, attitudes and behaviors should be interpreted cautiously, so our discussion is exploratory rather than conclusive. Thirdly, we addressed perceptions of cancer risk factors in general, instead of focusing on a specific cancer

localization, as in some previous studies (Peek et al., 2008; Marcus et al., 2013). Finally, there is a potential selection bias, as people living in retirement homes, hospitals or other institutions were excluded from the survey. The participation rate was also moderate (52%), and non-participants were younger and less educated. Nevertheless, it was very similar to those usually obtained in telephone surveys (McCarty, 2003), and we have no reason to suspect that perceptions of cancer risk factors were correlated with refusal, which was generally motivated by lack of time, or hostility toward telephone surveys.

Low SES and perception of environmental risk factors

Our results highlight the SES disparities in cancer risk perceptions. This differentiation remained significant, even after adjustment on respondents' main source of information on cancer. Regarding risk perceptions in general, previous studies have found that people with a low SES exhibit higher risk perceptions (Slovic, 2000; Finucane et al., 2000; Olofsson and Rashid, 2011).

Our results only partially fit this general pattern, as perceived financial vulnerability was correlated to higher perceptions for environmental risk factors for cancer. A previous British study already found that lesser educated people were more likely to believe that environmental factors (food additives, overhead power lines, pollution) may cause cancer (Wardle et al., 2001) and we found that such perceptions were associated to fatalistic attitudes. Perceived material hardship can fuel a feeling of powerlessness and vulnerability: deprived people are more prone to endorse fatalistic attitudes, believing that their health status is largely determined by forces outside their personal control (Davison et al., 1992), and/or considering their own body as a 'porous thing' completely open to any kind of threat (Douglas, 1992).

High SES and perception of behavioral and psychological risk factors

We also found that respondents with a higher SES score were more prone to emphasize behavioral factors. This result echoed previous studies which found that people with a higher SES, and especially those with a higher educational level, were more aware of behavioral risk factors for cancer, and reciprocally they were also more aware of protective behaviors against cancer (Wardle et al., 2001; Redeker et al., 2009; SC et al., 2009; Hawkins et al., 2010).

The propensity of people with a higher SES score to emphasize behavioral risk factors echoes contemporary "healthism": the rhetoric of self-empowerment conveyed by health promotion emphasizes individual autonomy and responsibility; it praises the entrepreneurial self who exercises control over one's behaviors to preserve one's health (Lupton, 1995); and people with a higher SES are more likely to endorse such dominant cultural feature (Peretti-Watel, 2013).

Regarding their higher propensity to consider psychosocial factors may cause cancer, it may be interpreted in relation with socially contrasted conceptions of health and body. Considering that stress, bitterness or painful experiences may cause cancer is an ancient belief (Lebrun, 1984), but it is in line with contemporary conceptions of body and health that place emphasis on psychosocial processes and on the somatization of psychosocial distress, and which are more prevalent among the upper classes (Bourdieu, 1984).

Risk perception and smoking status

Finally, the relationship between cigarette smoking and the propensity to emphasize environmental risk factors for cancer strongly echoed previous studies that found that smokers are prone to minimize the dangers of smoking because of the alleged ubiquity of risks ("everything causes cancer these days", including air pollution). There are several psychological or sociological explanations for such relationship. For example, the perception of environmental risks may ease smokers' cognitive strategies, as they are prone to endorse self-exempting beliefs

(Oakes et al., 2004), in order to reduce cognitive dissonance (Fotuhi et al., 2013) or to build their 'moral career' (Peretti-Watel et al., 2007).

Conclusion

Lay people's perceptions regarding cancer risk factors are embedded in social and cultural contexts: they reflect people's experience and beliefs (especially regarding one's body and health). As these perceptions are significant correlates of cancer-related attitudes and behaviors, their SES disparities may contribute to social health inequalities. But, in order to tackle them properly, prevention policies should not consider they simply reflect ignorance or misinformation.

Supplementary data to this article can be found online at <http://dx.doi.org/10.1016/j.pmedr.2016.01.008>.

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